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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/738,459	12/17/2003	James M. Tour	11321-P060US	9579

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EXAMINER	
WONG, EDNA	
ART UNIT	**PAPER NUMBER**
1753	

DATE MAILED: 03/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/738,459	TOUR ET AL.	
	Examiner	Art Unit	
	Edna Wong	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 February 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

This is in response to the Amendment dated February 21, 2006. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Response to Arguments

Specification

The disclosure has been objected to because of minor informalities.

The objection of disclosure has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 112

Claim **7** has been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The rejection of claim 7 under 35 U.S.C. 112, second paragraph, has been withdrawn in view of Applicants' amendment.

Double Patenting

I. Claims **1-7** have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-11 of copending Application No. **10/764,092**.

The rejection of claims 1-7 under the judicially created doctrine of

obviousness-type double patenting as being unpatentable over claims 1-11 of copending Application No. 10/764,092 is as applied in the Office Action dated September 29, 2005 and incorporated herein. The rejection has been maintained for the following reasons:

Applicants state that if the '"provisional"' double patenting rejection is the only rejection remaining in the Application, then the Examiner should withdraw the rejection and permit the Application to issue as a patent.

In response, the '"provisional" double patenting rejection is not the only rejection remaining in the Application.

II. Claims **1-7** are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-28 of copending Application No. **10/738,168**.

The rejection of claims 1-7 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-28 of copending Application No. 10/738,168 is as applied in the Office Action dated September 29, 2005 and incorporated herein. The rejection has been maintained for the following reasons:

Applicants state that if the '"provisional"' double patenting rejection is the only rejection remaining in the Application, then the Examiner should withdraw the rejection and permit the Application to issue as a patent.

In response, the '"provisional" double patenting rejection is not the only

rejection remaining in the Application.

Claim Rejections - 35 USC § 103

Claims **1-7** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Tsai et al.** ("The Welding of Carbon Nanotubes", *Carbon*, Vol. 38 (2000), pp. 1899-1902) in combination with **Bower et al.** (US Patent Application Publication No. 2002/0114949 A1).

The rejection of claims 1-7 under 35 U.S.C. 103(a) as being unpatentable over Tsai et al. in combination with Bower et al. has been withdrawn in view of Applicants' amendment.

Response to Amendment

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or

patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

I. Claims **8-18** are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-11 of copending Application No. **10/764,092**. Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that copending application since the referenced copending application and the instant application are claiming common subject matter, as follows:

(a) irradiating carbon nanotubes with microwaves.

The independent claims of the instant application recite similar limitations, either alone or in combination with their dependent claims, as that of the claims of the copending application wherein the claims of the instant application are encompassed by the claims of the copending application. Therefore, the claims would have been obvious variants over each other.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

II. Claims **8-18** are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-28 of

copending Application No. **10/738,168**. Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that copending application since the referenced copending application and the instant application are claiming common subject matter, as follows:

(a) irradiating carbon nanotubes with microwaves.

The independent claims of the instant application recite similar limitations, either alone or in combination with their dependent claims, as that of the claims of the copending application wherein the claims of the instant application are encompassed by the claims of the copending application. Therefore, the claims would have been obvious variants over each other.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 103

I. Claims **1-7** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hong et al.** ("Synthesis of Carbon Nanotubes by Microwave Heating", *Proceedings of the Sixth Applied Diamond Conference/Second Frontier Carbon Technology Joint Conference (ADC/FCT 2001)*, July 1, 2001, pp. 805-809) in combination with **DE 3915044** ('044).

Hong teaches a method comprising a step of irradiating acetylene with

microwaves. Cobalt or cobalt sulfide was loaded on organic polymer substrates as catalysts. Acetylene was used as a hydrocarbon source. Microwaves were directly irradiated on the catalyst particles which were impregnated or painted on the substrates. The microwaves were selectively absorbed by the catalyst particles, not by the substrates, local heating occurs, resulting in carbon nanotubes (CNTs) synthesis even on the organic polymer substrates (page 805, abstract).

The microwave radiation comprises a frequency that ranges from about 0.01 GHz to about 100 GHz (= 2.45 GHz) [page 806, "Synthesis and Characterization"].

The frequency ranges from about 1 GHz to about 18 GHz (= 2.45 GHz) [page 806, "Synthesis and Characterization"].

The microwave radiation is generated by a magnetron with a power that ranges from about 1 W to about 10,000 W (= 800 W) [page 806, "Synthesis and Characterization"].

The power ranges from about 10 W to about 1,000 W (= 800 W) [page 806, "Synthesis and Characterization"].

The method of Hong differs from the instant invention because Hong does not disclose the following:

a. Irradiating the carbon nanotubes with the microwaves as recited in claim 1.

Hong teaches irradiating acetylene with microwaves (page 805, abstract).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the irradiating step described by Hong by irradiating the carbon nanotubes with the microwaves because Hong teaches growing the CNTs (page 807, Fig. 1(b)). Growing the CNTs would have meant that their increase in size was by accretion of material from *parent CNTs* by the microwave irradiation.

b. To yield a plurality of crosslinked carbon nanotubes, as recited in claim 1.

Hong teaches that various shapes of carbons were observed including CNTs, nanofibers, nanoparticles and amorphous carbons (page 805, abstract).

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Hong teaches a similar process as presently claimed. Similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

Furthermore, this claim limitation is a *result* of performing the method and is not a method step.

c. Wherein the step of irradiating is carried out in an inert environment

selected from the group consisting of ultra-high vacuum, high vacuum, inert gases, and combinations thereof, as recited in claim 2.

Hong teaches purging any air in the reactor before the start of the microwave irradiation (page 806, "Synthesis and Characterization").

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the irradiating step described by Hong with wherein the step of irradiating is carried out in an inert environment selected from the group consisting of ultra-high vacuum, high vacuum, inert gases, and combinations thereof because Hong purged any air in the reactor before the start of the microwave irradiation (page 806, "Synthesis and Characterization").

d. Wherein the microwave radiation is generated by a magnetron, as recited in claim 5.

DE '044 teaches that a magnetron generates a microwave emission (abstract).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the microwave oven described by Hong with wherein the microwave radiation is generated by a magnetron because a magnetron generates a microwave emission as taught by DE '044 (abstract).

e. Wherein the crosslinked carbon nanotube material comprises at least one junction formed via the rearrangement of carbon atoms, as recited in claim 7.

Hong teaches that various shapes of carbons were observed including CNTs, nanofibers, nanoparticles and amorphous carbons (page 805, abstract).

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because the growing of the carbon nanotubes are deemed to inherently crosslink the carbon nanotube material to comprise at least one junction formed via the rearrangement of carbon atoms because similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

Furthermore, this claim limitation is a *result* of performing the method and is not a method step.

II. Claims **8-9 and 11-18** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hong et al.** ("Synthesis of Carbon Nanotubes by Microwave Heating", *Proceedings of the Sixth Applied Diamond Conference/Second Frontier Carbon Technology Joint Conference (ADC/FCT 2001)*, July 1, 2001, pp. 805-809) in combination with **DE 3915044** ('044).

Hong and DE '044 are as applied for reasons as discussed above.

The method of Hong differs from the instant invention because Hong does not disclose the following:

a. Wherein crosslinking is generated between the sidewalls of adjacent carbon nanotubes, as recited in claim 8.

b. Wherein the crosslinking comprises covalent bonds, as recited in claim 11.

c. Wherein the covalent bonds are carbon-carbon bonds, as recited in claim 12.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Hong teaches a similar process as presently claimed. Similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

Furthermore, these claim limitations are *results* of performing the method and are not method steps.

d. Wherein the carbon nanotubes are single-wall carbon nanotubes, as recited in claim 9.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Hong teaches a similar process as presently claimed. Similar processes can reasonably be

expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

Furthermore, this claim limitation is a *result* of performing the method and is not a method step.

III. Claim **10** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Hong et al.** ("Synthesis of Carbon Nanotubes by Microwave Heating", *Proceedings of the Sixth Applied Diamond Conference/Second Frontier Carbon Technology Joint Conference (ADC/FCT 2001)*, July 1, 2001, pp. 805-809) in combination with **DE 3915044** ('044) as applied to claims 8-9 and 11-18 above, and further in view of **Holzinger et al.** ("Sidewall Functionalization of Carbon Nanotubes", *Angew. Chem. Int. Ed.* (2001), Vol. 40, No. 21, pp. 4002-4005).

Hong and DE '044 are as applied for reasons as discussed above and incorporated herein.

The method of Hong differs from the instant invention because Hong does not disclose wherein the carbon nanotubes are chemically functionalized prior to the step of irradiating, as recited in claim 10.

Like Hong, Holzinger teaches carbon nanotubes. Holzinger teaches that the functionalization of carbon nanotubes is desirable to improve their solubility and processibility (page 4002, left column, first paragraph).

It would have been obvious to one having ordinary skill in the art at the

time the invention was made to have modified the carbon nanotubes described by Hong with wherein the carbon nanotubes are chemically functionalized prior to the step of irradiating because the functionalization of carbon nanotubes would have improved their solubility and processibility as taught by Holzinger (page 4002, left column, first paragraph).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Edna Wong
Primary Examiner
Art Unit 1753

EW
March 18, 2006